




Brown-needle disease and control measures

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SEED LEAFLET

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**Brown Needle Disease
and Control Measures**

*extract from Diseases of Forest Trees
widely planted as exotics in the tropics and
southern hemisphere*

by

I.A.S. Gibson

DANIDA FOREST SEED CENTRE



Title

'Brown Needle Disease' and Control Measures

Authors

Extract from 'Diseases of Forest Trees widely planted as exotics in the tropics and southern hemisphere' by I.A.S. Gibson

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1. Introduction

Brown-Needle Disease will often cause severe problems in pine nurseries and in young plantations.

The following account is largely cited from I.A.S. Gibson: 'Diseases of Forest Trees widely planted as exotics in the tropics and southern hemisphere' Part II. The Genus *Pinus*. Commonwealth Mycological Institute and Commonwealth Forestry Institute, England, 1979.

Occurrence

Initially observed in Japan and Korea, by 1979 mentioned as observed also in South and South East Asia, Central Africa and very locally in Brazil.

Causal agent

The fungus *Cercoseptoria pini-densiflorae*.

Susceptible

Most members of the genus *Pinus*. *Pinus caribaea* and *P. oocarpa* must be considered highly susceptible, while *P. patula* still is considered as being mildly or not attacked.

Late nursery stock and young plantations are attacked.

Symptoms

First, pale green bands on needles which turn yellow, later brown and finally greyish brown.

Severe defoliation and death of plants often occur.

Initially, attack occurs randomly scattered in the crop, but spreads to uniform infection if not controlled.

Conditions for attack

Conidia germinates between 10°C and 35°C with optimum at 25°C. Liquid water is essential.

Incubation period is 4-6 weeks.

Inoculum probably survives under unfavourable conditions as mycelium in plants and plant residues.

2. Control of the Disease

2.1 Non-chemical measures

In principle, losses because of attack of *C. pini-densiflorae* may be kept to a minimum by providing conditions unfavourable for the formation, spreading and growth (infection) of conidia of the pathogen.

In practice, the following measures should be taken:

In the nursery

- locating nurseries away from any plantation obviously infected by the disease
- maintaining good nursery hygiene with the nursery being kept free of surplus plants and plant residue and with attacked plants being removed or burnt
- proper weeding of nursery beds, pathways and vicinity of nursery
- production of robust seedlings by avoidance of too long shading and by hardening the plants as soon as possible before the onset of the rainy season
- breaks in the raising of pines in an area, e.g. temporary nurseries
- wide spacing of plants, e.g. 15 cm
- reduction of needle wetting to a minimum, e.g. by protection against rain (if practicable) and by irrigation from below by flooding nursery beds.

In plantations

- avoiding the transplanting of infected plants
- maintaining proper weeding regime
- pruning the lower branches to avoid direct contact with weeds
- removing and burning any infected plant or part of plants (usually the lower branches).

2.2. Using fungicides

Where the above measures are not possible or prove insufficient, fungicides may have to be applied. Amongst a number of possible chemicals, the following deals only with Benlate and Difolathane.

2.2.1. The chemicals

The fungicide Benlate (Benoml) and Difolathane belong to the list of effective measures of control over the 'Brown-Needle Disease'.

Benlate

Analysis: 50% Benomyl (Methyl 1-(butylcarbamoyl)-2-benzimidazole-carbamate) LD₅₀ (Lethal Dose): oral dose 10 gr/kg bodyweight.

Poisonous to fish; no danger class for human beings or wildlife. i.e. it has not been classified as a dangerous chemical for these.

Acting: Prophylactic or curative as a contact fungicide or as a systemic fungicide. Uptake through the roots, stem or leaves; upwards and outwards transport, never opposite.

Resistance build-up: Fast if used alone. Resistance also effective against other Benzimidazole fungicides. Negligible or nil if used early with other, differently acting, fungicide (here Difolathane).

Persistence: In soil up to a year. On plants, 50-60% active ingredients may be found after 3 weeks.

Difolathane:

Analysis: 80% Captafol (N-(1,1,2,2-tetrachloroethylthio)-cyclohex-4ene-1, 2-dicarboximide). LD₅₀ : oral dose 4.2 gr/kg bodyweight. Very poisonous to fish. No danger class for human beings or wildlife.

Acting: Prophylactic or curative contact fungicide.

Resistance build-up: No information

Persistence: No information

2.2.2. Problem with mycorrhiza

Formation and growth of mycorrhiza may be inhibited by fungicides.

Fungicides should reach only the uppermost part of the root system. For this reason applications should be infrequent and limited so as to avoid saturation of the soil with fungicide.

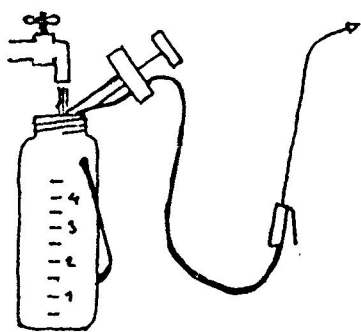
When seedlings have been exposed to heavy prophylactic or curative fungicide applications, the roots should be examined for the occurrence of mycorrhiza at the time of transplanting to the field.

2.2.3. Period and schedule of spraying scheme

Fungicide may be applied in prophylactic schemes or as curative treatment when symptoms of the disease occur. A prophylactic scheme may be modified so that no applications are done in periods of low risk of infection, e.g. the dry cool period December-April in North Thailand. the first application is then done when conditions become favourable to the fungus.

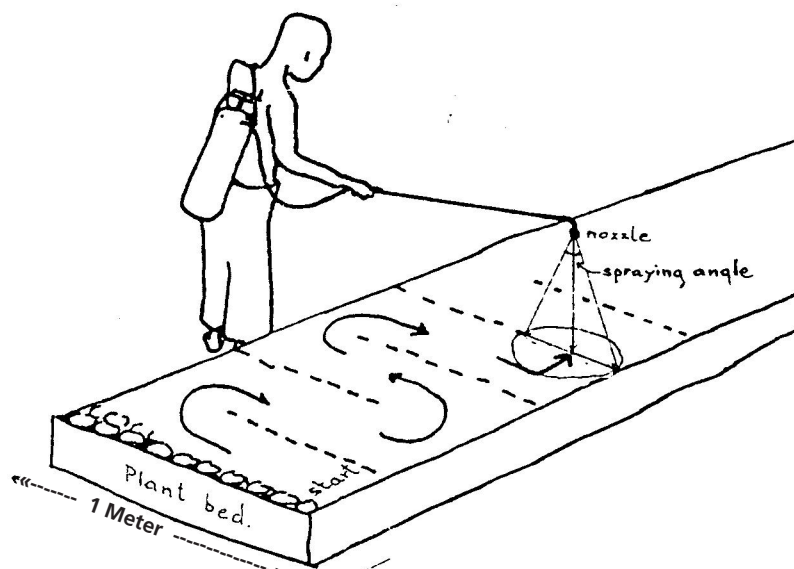
In Thailand pine seed is sown in December and transplanting into the field takes place by August. - Irrigation in the nursery is done from below. Soil preparation in the field is intensively mechanized enabling the transplanting of 15 cm tall plants with optimal top/root ratio.

①



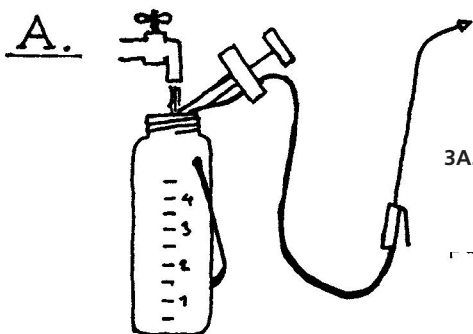
1. Fill 1 litre clean water in sprayer per 10 m² plant bed

②

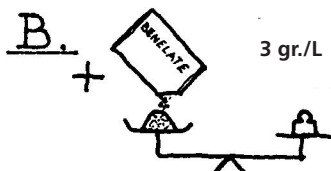


2. Practise the application with water on a similar plant bed,
Check: walking speed, nozzle adjustment, even distribution and no 'run-off'

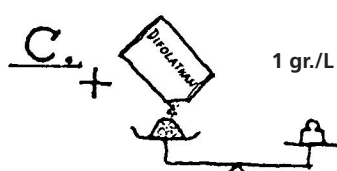
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3A. Fill 1 litre clean water per 10 m² plant bed.

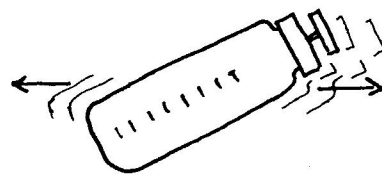


3B. Weigh out and pour 3 gr. Benlate per litre in sprayer.



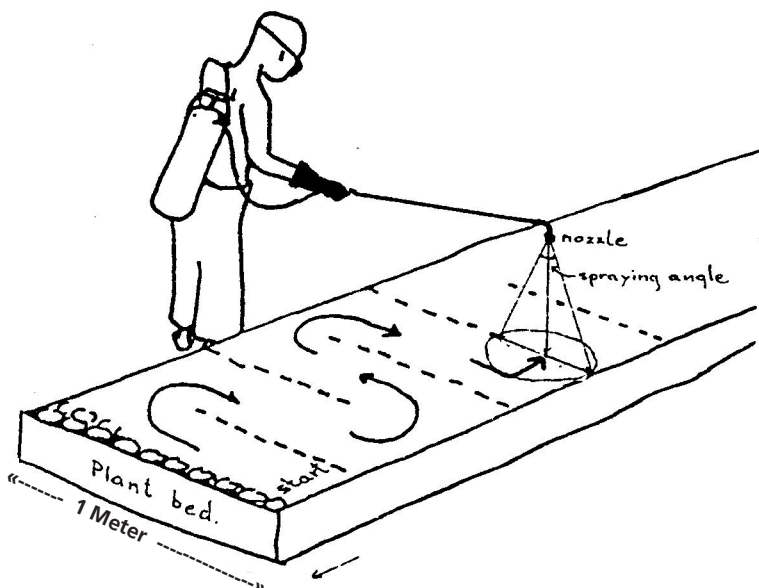
3C. Weigh out and pour 1 gr. Difolathane per litre in sprayer.

④



4. Close sprayer and shake well to mix.

⑤



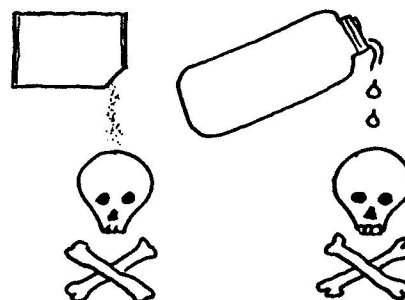
5. Apply fungicide on plant bed, use mask and gloves.
Clean the sprayer and wash hands after use.

⑥



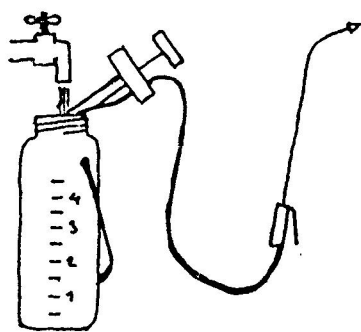
6. Repeat procedure every month.

⑦



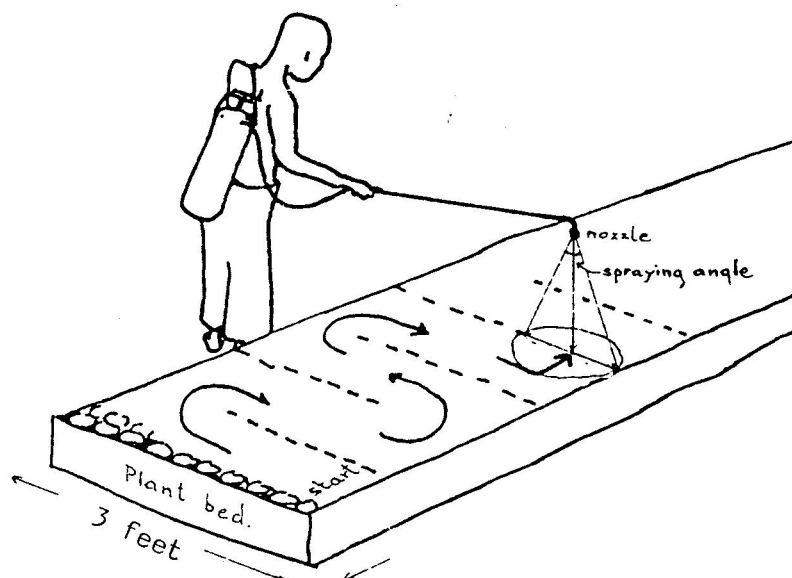
7. THE FUNGICIDES AND THE EMULSION
ARE POISON!

①



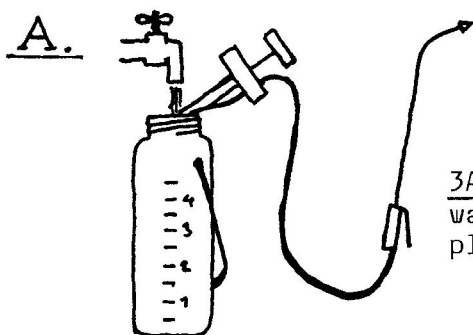
1. Fill 1 gallon clean water in sprayer per 3 x 160 feet plant bed.

②

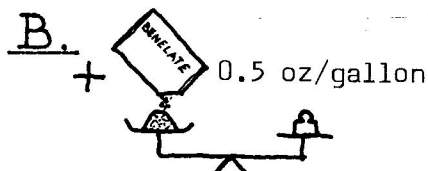


2. Practise the application with water on a similar plant bed. Check: walking speed, nozzle adjustment, even distribution and no 'run off'.

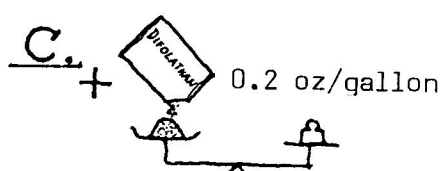
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3A. Fill 1 gallon clean water per 3 x 160 feet plant bed

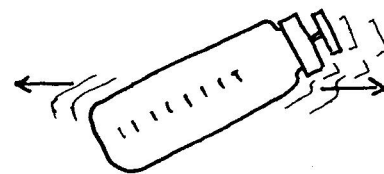


3B. Weigh out and pour 0.5 oz Benlate per gallon in sprayer.



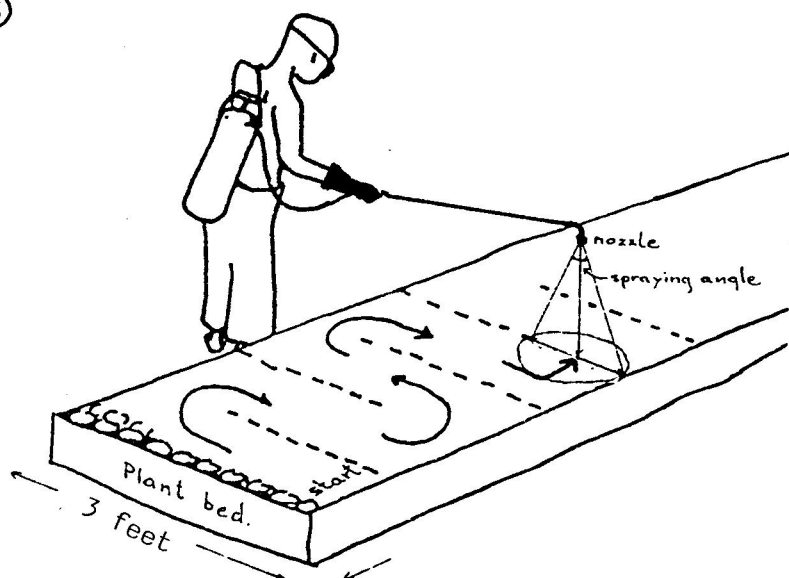
3C. Weigh out and pour 0.2 oz Difolathane per gallon in sprayer.

④



4. Close sprayer and shake well to mix.

⑤



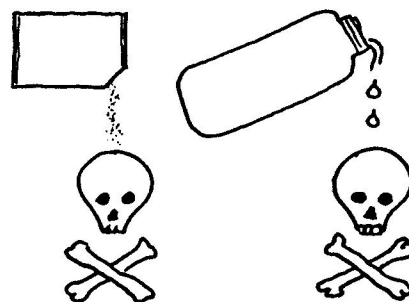
5. Apply fungicide on plant bed, use mask and gloves, clean the sprayer and wash hands after use.

⑥



6. Repeat procedure every month.

⑦



7. THE FUNGICIDES AND THE EMULSION IS POISON !

Rainfall and evaporation for two localities in Thailand are as follows:

Chiang Mai (Altitude 313 m)													
Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Rainfall (mm)	11	7	20	51	162	152	172	249	262	128	40	16	1270
Evaporation (mm Piche)	75	103	151	156	101	66	62	49	49	56	57	63	980
Chumporn (Altitude 3 m)													
Rainfall (mm)	120	68	65	76	172	169	195	189	160	339	361	159	2073
Evaporation (mm Piche)	58	55	66	66	58	54	51	52	50	41	41	50	642

Under conditions similar to **Chiang Mai** fungicide application in a prophylactic scheme may start by May when showers become frequent and evaporation rate decreases. Subsequent applications are done at one month intervals. If more frequent, the fungicides may accumulate in the soil and ultimately reach the lower root system.

Under conditions as in **Chumporn** a prophylactic scheme should start 3 weeks after sowing in pots or 2 weeks after transplanting. Subsequent applications at one month intervals.

Otherwise, under conditions where irrigation is done by sprinklers or watering cans from above, fungicides may in any case have to be applied early, i.e. 3 weeks after direct sowing in pots or 2 weeks after transplanting to pots from sowing bed. Subsequent applications at one month intervals.

In certain countries pine seedlings are raised to a height of about 30 cm over 1-1½ years. Unless irrigation is from below, a prophylactic scheme may have to continue throughout the whole period. We have no information on the possible effect on mycorrhiza formation during such a prolonged application scheme. If possible, applications should be interrupted in the dry season.

In areas of low risk of infection, fungicides may be applied only if plants show symptoms of attack by the disease. Not only the obviously infected plants but all pine seedlings should be treated.

Fungicide treatment in the nursery should stop at least 2 weeks before transplanting takes place in order that the workers may handle the plants safely.

Plants in the field should be inspected for symptoms of the disease until the dry season is established. At the first sign of symptoms of infection, the newly established plantation should be treated.

2.2.4 Directions for spraying

Fungicide preparation

A suspension of 3 grams Benlate and 1 gram Difolathane to 1 litre water is prepared. This amount will be sufficient for the application to 10 square metres of nursery bed *.

Application of fungicides

Limitation of needle wetting because of rain or irrigation will permit the fungicide to remain the longest possible time on the plant to act as a contact prophylactic agent as well as preventing germination of the conidia, thus diminishing the need for frequent applications.

The fungicide should be placed on the plants. This should be done with a pressure sprayer (e.g. knapsack sprayer) ensuring small drops and good adherence to the plants before "run off".

Before application of the chemical suspension, the same amount of pure water should be tried on a similar area to find the correct method ensuring an even distribution of the fungicide.

The height of the nozzle above the plant bed should correspond to the spreading angle, see figs. 2 and 3. The bed can be divided into strips but spraying should overlap only to ensure an even distribution. The walking speed should be checked to ensure a distribution that fits with the amount of liquid required. Note that the amount that the pressure sprayer applies will decrease as pressure falls.

Spray during calm and dry weather (preferably at sunset) and check that nozzle adjustment does not atomize the drops resulting in a drift of mist. Drift lengthwise in the plant bed is not as bad as crosswise.

It is necessary to know the working pressure and nozzle spraying angle of the sprayer for a proper dosage. For example, a knapsack sprayer working at 3 bar (= 2.96 atm- or 3059 gr/cm² or 2250 mm Hg (0°C) with a nozzle giving 0.8 litre/minute at a spreading angle of 60° will cover 2 m² bed with 0.1 litre in 15 seconds **.

Safety precautions

Working with chemicals may present a risk to human and animal health, so study and follow carefully the guidelines for safe use of the chemicals written on the label attached to the packet containing the chemicals.

Units in English

*) 13.5 gr. or 0.5 oz Benlate and 4.5 gr. or 0.2 oz Difolathane to 1 gallon of water will cover 45 m² or 1 pint will cover about 20 feet of a seed bed 3 feet wide (60 ft²)

**) A knapsack sprayer working at 3 bar or 43 lb/in² with nozzle giving 28 fl.oz/min (spreading angle 60°) will cover 3 feet x 3 feet in about 7 seconds.

Consumption of fungicide

A 5-hectare-plantation requires 6,750 plants at 3 x 3 m (or 9 x 9 feet), including replanting. To allow for usual losses in nursery, about 13,500 plants have to be prepared.

- pot diameter 5 cm (2 inches)
total 34 m² or 40 yards of bed 3 feet wide
- fungicide suspension per application is 3.4 litre or about $\frac{3}{4}$ gallon
- 6 applications in a season correspond to 20 litres or 4.5 gallons, using a total of 60 gr. or 2.1 oz Benlate and 20 gr or 0.7 oz Difolathane
- for larger sized pots and longer period prophylactic up to **120 gr (\approx 4.2 oz) Benlate and 40 gr (\approx 1.4 oz) Difolathane** may be required

The fungicide are supplied in 200 gr. (\approx 7 oz) packages.

CAUTION !

Keep out of reach of children

DANGER

Avoid swallowing and inhaling of powder and solution.

Avoid contact with eyes, skin and clothes.

Use protective gloves and mask. Protect skin by wearing long-sleeved shirt and long trousers. Wash contaminated clothes separately in hot water. Wash hands before meals and after work.

Crops for human or animal consumption must not be treated later than 4 weeks before harvest.

Extremely toxic to fish.

USE

To be used only against fungous diseases in the open or in greenhouses.

Dosage must not exceed those stated in the note on "Brown-Needle Disease".

The solution of chemicals should be used straight after its preparation.

Use up each container or packet before opening the next.

To empty containers or packets completely, they should be rinsed thoroughly with water and this added to the last lot of solution.

STORAGE

Keep the chemicals in original container or packet, tightly closed, in a safe place out of reach of children.

Must not be stored together with food, drink and tobacco, nor with animal fodder.

The product may lose effectiveness if allowed to become damp during storage.

Keep containers or packets tightly closed in a cool dry place.

EMERGENCY

If in eyes, wash eyes for at least 15 minutes and see a doctor. For skin contact, wash immediately with soap and water. See a doctor if irritation occurs or rash develops. If swallowed, immediately drink a large quantity of water and induce vomiting. See a doctor immediately.